

broken-up, and shapeless remnants of dark crumbly matter. The two lowest cells, evidently the first that were built by the wasp, were completely lined with silk. Here the eggs seem to have developed up to the pupal stage; there was no sign of development in any other cell. Holes in the walls separating the cells from each other indicated that the ants had succeeded in penetrating them and had eaten the contents.

49, PALI HILL,
BANDRA,
BOMBAY 50-AS,
December 19, 1962.

D. E. REUBEN

18. *ODONTOTERMES OBESUS* RAMB. AS A PEST OF JAPANESE MINT

(With two plates)

The termite *Odontotermes obesus* Ramb., the common mound-building termite, is widely distributed throughout India and has been observed to attack a large number of trees like *Grevillea*, Coconut Palm, *Ficus*, etc. in addition to sugar-cane setts, paper, cloth, and other articles of economic importance. The insect is an occasional wood-eater, otherwise making fungus beds for its food.

The present paper describes damage to standing crop of *Mentha arvensis haplocalyx* Briquet var. *piperascens* Holmes, the common Japanese mint, cultivated for the production of mint oil and menthol.

Japanese mint is a perennial herb propagated by suckers, planted in February. It begins to sprout after spring rains in early March. The aerial portions of the plant are harvested and distilled. A first crop is usually harvested in June-July and a second in October. This is an essential oil-bearing plant of major economic importance.

The attack was observed in May at Chakrohi, Jammu District, J. & K. State, and attacked plants were collected from Miran Sahib farm at Jammu District in early August 1962, by the authors. The attack was more intensive on plants growing on raised portions of the field. It was first thought that this withering was due to some soil fungi but closer examination revealed the presence of numerous termites.

The affected portion of the field looked dry. In fact 50-60% of the plants were either in a process of drying or totally dry. In

addition some of the green plants were also found to be attacked. Of these, 15-20% had no roots at all and showed symptoms of wilting. A good number of the others had no main root but were sustained by the presence of side shoot or shoots, supplying necessary nutrients to the main stem (Plate II, C).

The infested plants show progressive wilting from the lower leaves upwards, and growth is inhibited as the roots are continuously eaten by the termites. This wilting is succeeded by gradual drying and yellowing of the leaves and the plant ultimately dies when no side shoots are thrown out with supporting roots to supply the necessary nutrients. Sometimes the roots are eaten up so fast that the plants remain standing as such while the root is totally consumed (Plate II, D).

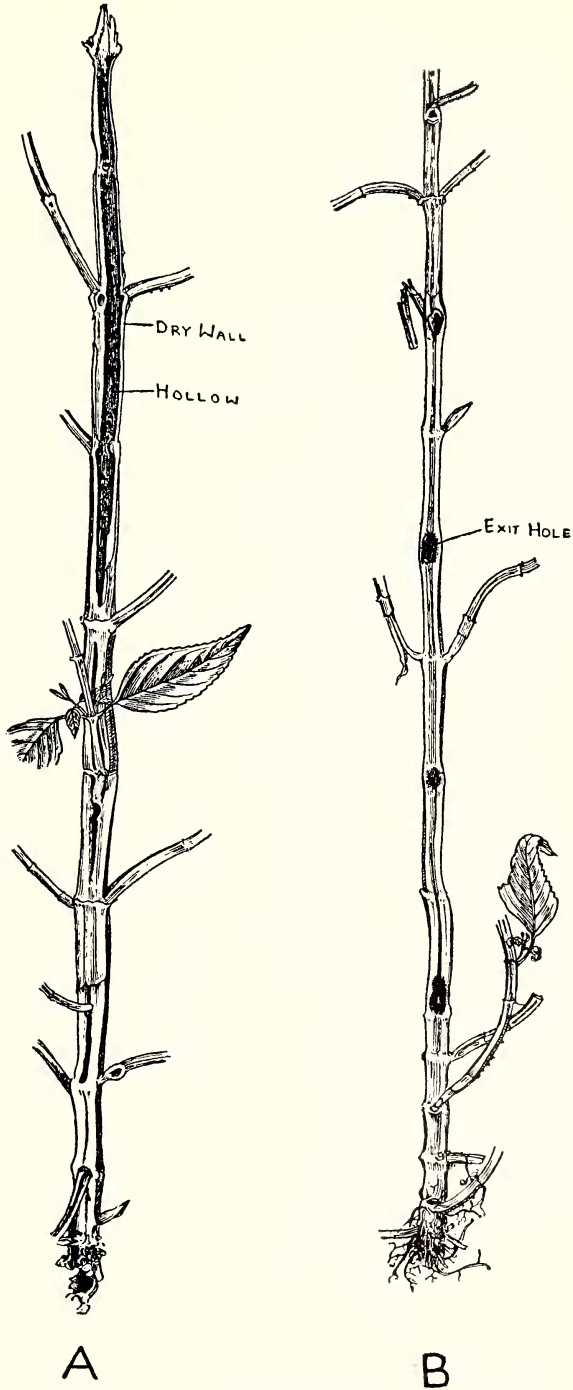
The damage is usually restricted to the underground parts which are destroyed partially or completely by the termite leaving no trace of the root in the soil. At times, when the injury is not confined to the roots alone, the insect enters the stem by tunnelling through the cortex into the pith of the stem. The epidermis together with the left-over hypodermal portion dries up but is strong enough to keep the dry plant standing on the soil. In certain other cases, these termites have been observed to go up to the very tip of the shoot that they infest. In this case the insects were observed to have one or several exit holes to the outside on the hollow stem. Many holes are therefore observed on the dry, hollow, standing stem (Pl. I, B and II, E, *a*). This mode of boring out is in no way universal and at times the termites find their way back through the tunnel through which they enter (Pl. II, D, *a*).

A split stem at this stage of acute infestation shows a hollow tunnel formed of the original vascular and cortical regions together with the hollow pith, surrounded by a thick or thin layer of epidermal and hypodermal cells (Pl. I, A and II, F). Sometimes the hollow tunnel is seen to be full of a spongy, clayey substance together with black particles of organic matter and fungus bodies.

Termite mounds, about 6 ft. tall, were located in a garden adjacent to the infested fields of Miran Sahib farm, and a smaller one about a foot in height was found at the base of a tree near the infested field.

CONTROL

(1) As the attack is more intensive on plants growing on raised patches of soil, levelling of the field is recommended.



Japanese Mint Plant

- A. Showing the split stem. Only a thin wall is left encircling a hollow ;
- B. Showing the holes made by the termites for their exit.